AIP report MANPOWER STATISTICS DIVISION

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EMPLOYMENT SURVEY 1981

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Each summer physics degree recipients at the bachelor's master's, and doctorate levels are contacted and asked about their post-degree employment plans. The responses to that question generally range from precise descriptions of initial employment to vague expressions of intentions and uncertainties. Since the largest number of degrees are granted in May and June, a follow-up Employment Survey conducted in December allows the Employment-oriented degree recipients a minimum of six months to select and get involved in their careers.

Included in this survey are graduates who were granted physics degrees between July 1980 and June 1981, and who indicated in one of two summer surveys their interest in employment. A major focus of the Employment Survey is on the time it takes new physicists to secure initial employment and the circumstances that lead to the beginning of their careers.

Highlights of this report are:

At the doctoral level experimentalists are more likely to be offered potentially permanent positions while theoreticians are more likely to accept 'post-docs'

The periods of time for which 'postdocs' are offered are becoming longer.

An increasing proportion of physics bachelors enter military service.

The majority of new physics bachelors and masters secure initial employment within a two-month period.

Figure I focuses on physics graduates interested in potentially permanent positions; for that reason 'postdocs' are excluded from that figure. Although a small shift has occurred toward requiring more time than in the previous year in which to secure employment, the same general conclusion can be drawn: that the majority of physics bachelors and masters accept suitable employment within two months while the majority of doctoral graduates takes three months or longer before accepting potentially permanent positions.

The first set of bars with the notation "< 1 month" refers to degree recipients who have positions lined up at the time of

Fig. I. Time spent by 1980-81 physics degree recipients in securing employment.

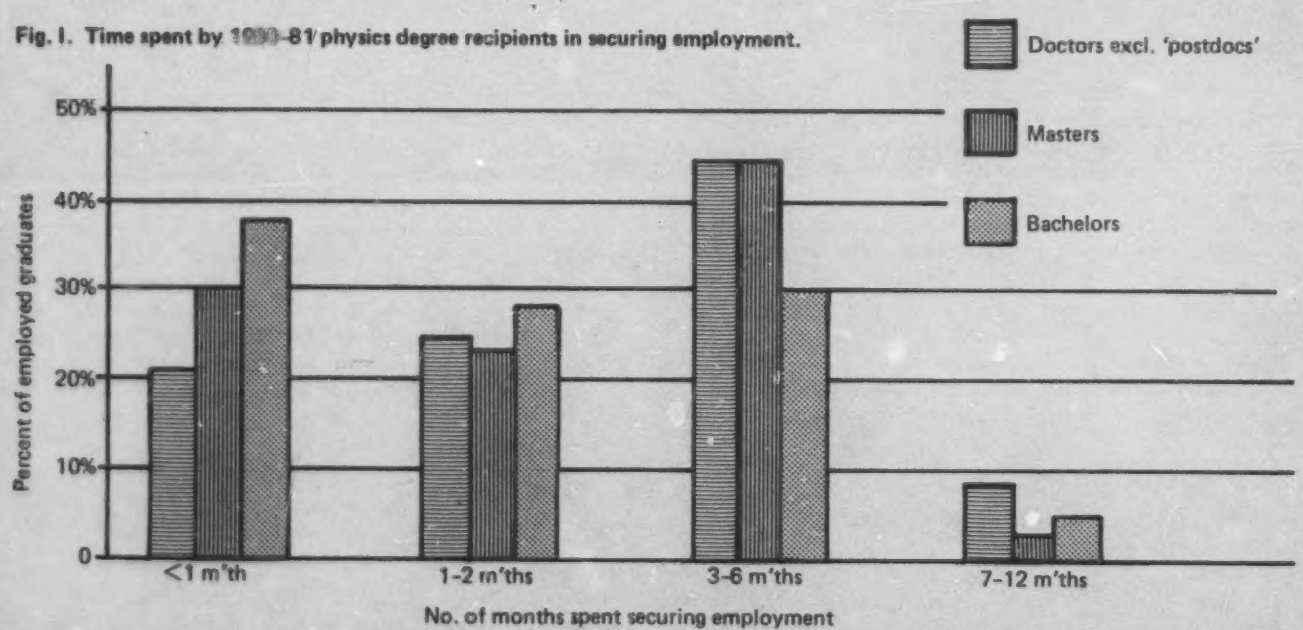

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Table I. Changes in occupational status of physics degree recipients between the summer of 1981 and the following winter.

Employment status reported by physics degree recipients, summer 1981	Occupational status, winter 1981–82						
		'Postdoc' or student	Employed full-time perm.	Employed p-t, temp., other	Not empl. and seeking	Total N	Total %
Doctors							
Newly accepted empl.		4	151	1	-	156	38
Continuing employment		2	29	-	-	31	8
'Postdoc'		152	13	-	-	165	40
Other*		15	16	5	4	40	10
Not empl. and seeking		7	8	2	1	18	4
Total respondents	N	180	217	8	5	410	
	%	44	53	2	1		100%
Masters							
Newly accepted empl.		2	88	-	-	90	47
Continuing employment		-	43	1	-	44	23
Career military		-	10	-	-	10	5
Other*		2	10	1	1	14	7
Not empl. and seeking		3	22	1	9	35	18
Total respondents	N	7	173	3	10	193	
	%	4	90	1	5		100%
Bachelors							
Newly accepted empl.		2	393	3	4	402	52
Continuing employment		3	100	2	1	106	14
Military service		1	101	-	-	102	13
Volunteer or temp.		1	7	-	1	9	1
Will be seeking empl.		2	34	10	10	56	7
Not empl. and seeking		2	88	2	12	104	13
Total respondents	N	11	723	17	28	779	
	%	1	93	2	4		100%

**This group of graduates includes those who hold temporary positions, as well as those who reported "will be seeking employment". Doctoral candidates included 31 of the latter because they had not yet completed the requirements for their doctorates.*

graduation. Also included in this category is an increasing number of physics bachelors and masters who had combined employment with the completion of their physics degrees. Another observation worth noting is that in 1981, 47% of the masters required three months or longer to secure employment; in 1980 only 36% were in this category because a correspondingly larger proportion took, at most, two months to accept positions.

As a follow-up survey, the Employment Survey compares the occupational status of new degree recipients in the summer of 1981 with that of the same graduates six months later, the winter of 1981–82; **Tables I** and **II** highlight those changes for physics and astronomy graduates respectively. Giving special attention to the group which described itself as "not employed and seeking" in the summer of 1981, one observes a considerable reduction in those percentages at the end of a six-month period. Specifically, **Table I** shows that the 4%, 18%, and 13% of physics doctors, masters, and bachelors who were "not employed and seeking" in the summer of 1981 declined to 1%, 5%, and 4% respectively in the following winter. **Table II** indicates similar declines for the three levels of astronomy graduates, but their numbers are much smaller.

Table II. Changes in occupational status of astronomy recipients between the summer of 1981 and the following winter.

Employment status reported by astronomy degree recipients, summer 1981

Doctors		Occupational status, winter 1981-82: 'Postdoc' or student	Full-time employed	Other	Not employed and seeking	Total N	Total %
Newly accepted empl.		-	11	1	-	12	26
Continuing employment		1	1	-	-	2	4
'Postdoc'		28	1	-	-	29	63
Not empl. and seeking		2	1	-	-	3	7
Total respondents	N	31	14	1	-	46	
	%	67	31	2	-		100%
Masters							
Newly accepted empl.		-	1	-	-	1	20
Cont., incl. military		-	3	-	-	3	60
Other		-	-	1	-	1	20
Total respondents	N	-	4	1	-	5	
	%	-	80	20	-		100%
Bachelors							
Newly accepted empl.		1	22	-	1	24	65
Cont., incl. military		-	4	-	-	4	10
Temporary empl.		-	1	-	-	1	3
Not empl. and seeking		-	8	-	-	8	22
Total respondents	N	1	35	-	1	37	
	%	3	94	-	3		100%

Doctoral physicists and astronomers

Frequent questions directed at us call for analyses which distinguish between experimentalists and theoreticians. Thus **Table III** analyzes the 400 new doctoral physicists by dividing them into those whose dissertation was experimental and those whose dissertation was theoretical. On that basis the table shows clearly that experimentalists are more likely to be offered potentially permanent positions, whereas theoreticians are more likely to accept 'postdocs'.

Table III. Occupational status of experimental and theoretical physicists by type of dissertation research, 1981-82.

Occupational status		Experimentalists	Theoreticians	Total N	Total %
Full-time empl.		60%	38%	215	54
'Postdoc'		38	55	170	43
Other		1	5	8	2
Unempl. & seeking		1	2	5	1
		100%	100%		
Total	N	291	107	398	
	%	73	27		100%

Table IV. Characteristics of postdoctoral and full-time employed physics and astronomy doctorate recipients, 1980–81.

Characteristics	Physics 'Postdocs'	Physics Full-time employed	Astronomy 'Postdocs'	Astronomy Employed	Characteristics
Sex					**Sex**
Female	7%	7%	7%	12%	Female
Male	93	93	93	88	Male
Age					**Age**
26 or younger	13%	6%	13%	-	26 or younger
27 yrs.	13	11	17	13%	27 yrs.
28 yrs.	26	18	20	19	28 yrs.
29 yrs.	16	20	20	19	29 yrs.
30 yrs.	9	11	13	6	30 yrs.
31–32 yrs.	13	14	7	12	31–32 yrs.
33 or older	10	20	10	31	33 or older
Citizenship					**Citizenship**
U.S.	71%	86%	87%	100%	U.S.
Foreign	29	14	13	-	Foreign
Type of research					**Type of research**
Experimental	52%	58%	63%	63%	Observational
Theoretical	38	26	20	12	Theoretical
Both	10	16	17	25	Both
Major subfields of dissertation					**Major subfields of dissertation**
Astrophysics	7%	4%	10%	-	Astrophysics
Electron, atomic & molec.	6	9	30	25%	Cosmology, extragalactic, quasi-stellar objects
Elem. particles	28	9	-	19	Galactic structure, stellar motions
Nuclear	9	7	17	-	Interstellar matter and gaseous nebulae
Optics	3	5	27	25	Stellar atmospheres and spectra, stellar evolution, solar and stellar interiors
Plasma	2	10			
Solid state	29	35	7	13	Supernovae, x, γ, and cosmic rays, pulsars
			9	18	Other
Number of respondents	174	217	31	15	

Table IV focuses on the doctoral physicists and astronomers to determine the type of initial employment each scientist accepted. As in past years, more physicists accepted potentially permanent employment than temporary postdoctoral fellowships, whereas, the reverse is true for the astronomers. **Table IV** also shows which, if any, of five characteristics influence the type of employment physicists and astronomers are offered. Thus it appears that doctorate recipients who accepted 'postdocs' are younger, include more foreign citizens, and tend to be theoreticians. In regard to the subfields of their dissertation, only elementary particles stands out as that with which new degree recipients are more likely to be offered 'postdocs' than potentially permanent employment.

The ratio of doctorates conferred on physicists to those conferred on astronomers is approximately ten-to-one, and the respondents from these groups form the same ratio. The questions directed at these two groups of graduates are similar, which accounts for the parallel analysis presented in **Tables I, II and IV**. However, a further examination of the characteristics is no longer meaningful for so small a group as the astronomers comprise. Thus **Figure II** includes only physicists, and explores further the differences between 'postdocs' and those with potentially permanent employment. For example, postdoctoral fellowships are temporary and low-paying, but to many graduates they offer an opportunity to continue the research of their dissertations. Thus it may be of interest to know how many physicists specifically sought these fellowships and even declined other offers to accept them. On the other hand, appropriate questions for physicists who had accepted permanent positions concern the type of work and prospect of changing subfields. **Figure II** summarizes the response from both groups. Compared with the previous year, by far fewer 'postdocs' (11% fewer) were in the position of "declining other offers to accept (their) 'postdocs'." But an almost identical proportion of the physicists in potentially permanent positions accepted physics-related initial employment; to do so, more of them had changed subfields, (40%, compared with 34% in the previous year).

Although not included in **Figure II**, it may be worth noting that when theoreticians secure potentially permanent positions, fewer than one-third of them find employment in the same subfield they chose for their dissertations. On the other hand, making a 'postdoc' one's initial employment as a theoretician, almost assures the graduate of "no change in subfield."

Continuing the comparison between 'postdocs' and graduates with permanent positions, **Table V** examines the relative demand for graduates in major subfields. For example, permanent positions are offered to far more plasma than elementary particle physicists. **Table V** also substantiates the statement made in connection with **Figure II** by showing how much greater a proportion of 'postdocs' remain in their chosen subfields than that of graduates with permanent positions.

Fig. II. Employment status of 1980-81 doctoral physicists 6-18 months after graduation.

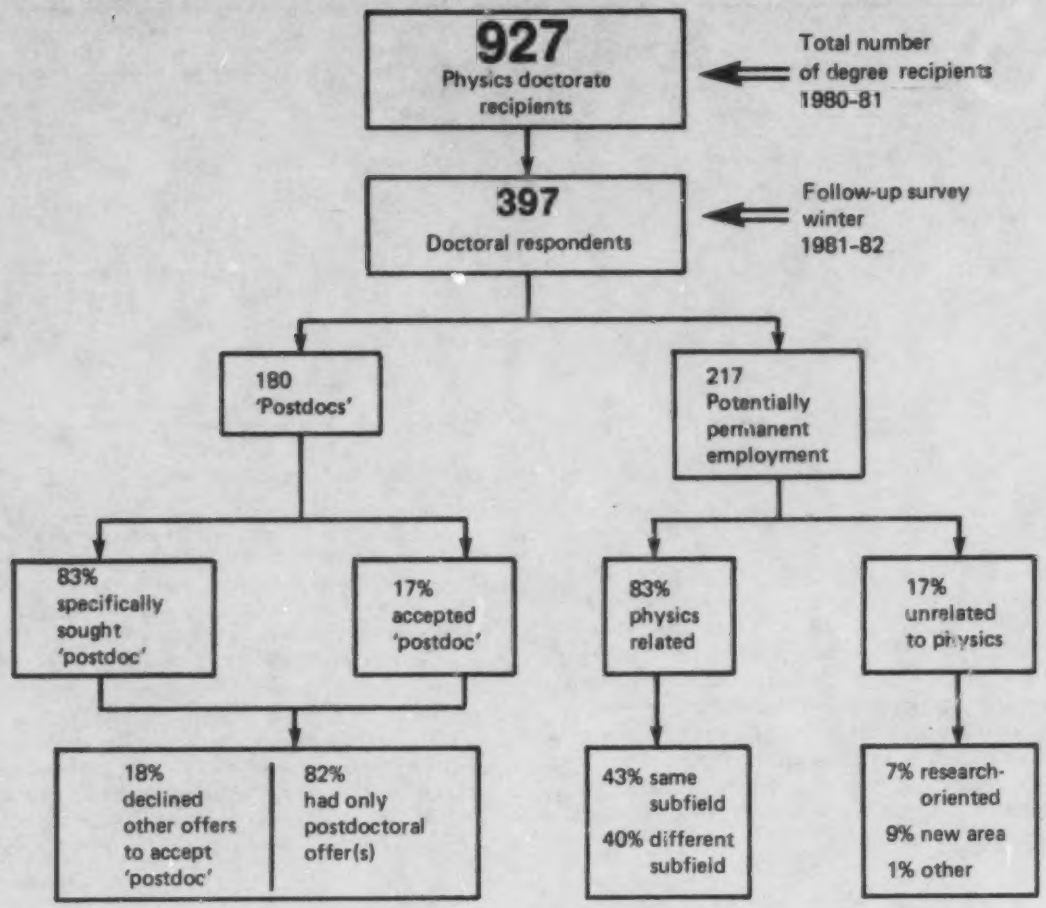

Table V. Subfield mobility of doctoral level physicists, 1980-81.

Major subfields of dissertation	'Postdocs' Number responding	'Postdocs' % of respondents holding 'postdocs' in same subfield	Graduates with potentially permanent positions Number responding	Graduates with potentially permanent positions % of respondents employed in same subfield
Astrophysics	12	100%	8	75%
Elem. particles	49	88	12	25
Electron, atomic & molec.	10	90	15	40
Nuclear	16	94	9	33
Optics	6	33	11	36
Plasma	4	75	22	64
Solid state	48	88	58	66
Cross disciplinary	6	100	12	67
All subfields combined	169	85%	173	58%

Table VI. Factors influencing the length of postdoctoral fellowships for 1980–81 doctoral level physicists.

Characteristics			Length of 'postdoc' ≤1 yr.	1.5 to 2 yrs.	>2 yrs.	Total %	N
Citizenship	U.S.		25%	62%	13%	100%	123
	Foreign		35	56	9	100	51
Selected subfields of PhD	Astrophysics		17%	66%	17%	100%	14
	Electron, atomic & molec.		25	63	12	100	12
	Elem. part.		20	57	23	100	44
	Nuclear		38	62	-	100	13
	Solid state		33	60	7	100	43
Plan	Specifically sought 'postdoc'	yes	23%	64%	13%	100%	144
		no	50	46	4	100	30
Total respondents		N	49	104	21		174
		%	28	60	12	100%	

During the past decade the periods of time over which postdoctoral fellowships were offered became longer, a change probably related to the fluctuations in the employment market. **Table VI** relates the lengths of physics fellowships to three characteristics of their recipients. Citizenship is the first characteristic listed, and it is evident from the distribution shown in the table that foreign degree recipients were offered shorter 'postdocs'. Subfields seem to have little influence on the lengths of fellowships with the possible exception of elementary particles, 23% of whose graduates reported 'postdocs' of at least three years' duration. The last characteristic presented in **Table VI** indicates that fellowships of longer duration are offered to those who specifically seek 'postdocs'.

Turning our attention to the new doctoral physicists who had accepted employment with potential permanence, **Table VII** presents their distribution of employers and shows that a majority are employed in industry. Since most of these new physicists have held those positions anywhere from 6 to 18 months, it seemed appropriate to ask them to evaluate their initial employment, and even include a question concerning the possibility of job changes in the next two years. The data in **Table VII** indicate that the largest single group does perform physics-related work and is engaged in industrial research, development and design; the training of those physicists was probably in solid state physics and most of them were not interested in a job change for the near future. In comparison

Table VII. Employment with potential permanence accepted by 1980–81 doctorate recipients.

		Type of employer: Univ.	4-yr. coll.	Industry	Gov't	FFRC	Other	Total N	%
Subfield of PhD	Cross disciplinary	1	-	10	2	-	4	17	8
	Elec., atomic, molec.	4	1	4	4	4	3	20	9
	Elem. particles	4	2	8	1	3	1	19	9
	Nuclear	3	1	6	-	3	-	13	7
	Optics	2	-	9	-	-	-	11	5
	Plasma	3	-	11	2	5	3	24	11
	Solid state	12	1	57	4	3	4	81	35
	Other	9	5	11	5	4	2	36	16
Work activity	Teaching	4	7	-	-	-	2	13	6
	Research	11	-	23	9	7	3	53	24
	Teaching & research	16	3	1	-	-	2	22	10
	Res./dev./design	7	-	81	8	14	5	115	52
	Management training	-	-	4	1	1	3	9	4
	Other	-	-	7	-	-	2	9	4
Physics related work	Same subfield	27	5	38	9	10	6	95	43
	Different subfield	10	5	48	8	9	7	87	40
Unrelated to physics	Research-oriented	-	-	9	1	3	3	16	7
	New area	1	-	18	-	-	1	20	9
	Other	-	-	3	-	-	-	3	1
Interested in a job change	Yes	16	5	14	7	5	7	54	25
	No	12	3	88	6	14	8	131	59
	Unsure	10	2	14	5	3	2	36	16
Total respondents	N	38	10	116	18	22	17	221*	
	%	17	5	52	8	10	8		100%

**Includes 217 full-time employed from Table I, plus 4 included under "other".*

with the previous year there was a six percentage-point shift from basic research to research development or design and a three percentage-point increase in physicists who are employed in a new area.

New physics masters

The number of master's level respondents to this 1981 survey was 18% higher than that of the previous year, but the unemployed group decreased by one percentage-point. Over ninety percent of the master's level respondents were employed full-time and there was little variation in employment status by age, citizenship, sex etc. Up until last year between 6% and 10% of the responding physics masters reported physics education as their area of specialization; this survey includes only one respondent with an education specialty among the almost 200 respondents.

Table VIII presents six characteristics of new physics masters and examines their influence on the "time spent finding employment" which is divided into four categories. The first category, <1 month, includes degree recipients who chose to remain with the same employer, frequently the one who helped finance the graduate education. An indication of this conclusion comes from the age distribution which shows that almost half of the graduates 29 or older fall into this first category. Dividing the type of employment into that which is physics-related and that which is not, we find that securing the former type requires a little more time.

Although very few students graduate with a master's degree in physics teaching, 10% of the respondents listed teaching as their major work activity and **Table VIII** shows how quickly those graduates secured their teaching positions. Their employers include the military as well as universities, colleges and high schools.

Table VIII. Characteristics of 1980-81 physics masters that influence the time required to secure employment.

Characteristics		Time spent finding employment					Total	
		<1 mo.	1-2 mos.	3-6 mos.	7-12 mos.		N	%
Sex	Female	12%	47%	41%	-	100%	17	10%
	Male	32	20	46	2%	100	159	90
Age	23 or younger	29%	14%	57%	-	100%	7	4%
	24 yrs.	35	17	41	7%	100	29	16
	25 yrs.	19	28	50	3	100	37	21
	26 yrs.	18	32	50	-	100	22	13
	27-28 yrs.	24	24	52	-	100	38	22
	29 or older	46	19	14	21	100	43	24
Type of graduate institution	Doctorate-granting	30%	21%	46%	3%	100%	129	73%
	Master's-granting	28	28	44	-	100	47	27
Type of employment	Physics related	28%	21%	48%	3%	100%	141	80%
	Unrelated to physics	37	29	34	-	100	35	20
Major employer	Industry	24%	23%	52%	1%	100%	109	62%
	Gov't/military	37	23	34	6	100	35	20
	Coll/univ.	50	15	35	-	100	20	11
Major work activity	Teaching	41%	24%	35%	-	100%	17	10%
	Res. & dev.	32	20	43	5%	100	65	37
	Dev. or design	17	26	57	-	100	42	24
	Data analysis	27	23	47	3	100	30	17
Total respondents	N	52	40	80	4		176	
	%	30	23	45	2			100%

Table IX. Characteristics of 1980–81 physics bachelors that influence the time required to secure employment.

Characteristics		Time spent finding employment					Total	
		<1 mo.	1–2 mos.	3–6 mos.	7–12 mos.		N	%
Sex	Female*	32%	28%	37%	3%	100%	123	17%
	Male	39	28	29	4	100	617	83
Age	21 or younger	37%	34%	24%	5%	100%	39	5%
	22 yrs.	39	27	31	3	100	329	44
	23 yrs.	29	28	38	5	100	164	22
	24–25 yrs.	40	29	29	2	100	103	14
	26–29 yrs.	44	28	22	6	100	72	10
	30 or older	59	19	22	-	100	33	5
Type of bachelor's institution	Doctorate-granting	36%	28%	30%	6%	100%	312	42%
	Master's-granting	43	27	26	4	100	91	12
	Bachelor's-granting	40	27	31	2	100	337	46
Type of employment	Physics related	31%	29%	35%	5%	100%	441	60%
	Unrelated to physics	49	26	22	3	100	299	40
Major employer	Industry	26%	32%	37%	5%	100%	464	63%
	Coll/univ.	41	44	12	3	100	33	5
	Government	37	24	37	2	100	81	11
	Military	81	11	8	-	100	118	16
Major work activity	Computer programming	32%	33%	30%	5%	100%	117	16
	Data analysis/quality control	29	32	37	2	100	97	13
	Res./dev. or design	25	28	39	8	100	201	27
	Res. ass't/technician	35	32	30	3	100	75	10
Total respondents	N	281	207	223	29		740	
	%	38	28	30	4			100%

**The actual distribution of women among the employment-oriented physics bachelors is 13%; women are more apt to respond to AIP surveys.*

New physics bachelors

A similar analysis reveals that there are two paths which assure new physics bachelors of obtaining employment in a short time; these are entering the military, or being satisfied with employment which is not necessarily related to physics. These conclusions are drawn from the data in **Table IX**, which relates six characteristics to the time bachelors required before starting employment.

Similar to the physics masters, a bachelor's age at the time of graduation appears to influence how long it takes to begin employment—the older groups require less time. On the other hand, type of bachelor's institution appears to have little influence on the time required to find employment. Industry continues to be the largest employer, and work activities are very similar to those reported in prior years.

New astronomy bachelors

The graduating class of 1981 included 156 astronomy bachelors of whom an estimated 90 were interested in employment rather than pursuing a career in astronomy. The number of respondents to this follow-up survey was 35, all of whom contributed both job descriptions as well as salary data which are summarized in **Table X**. By dividing the respondents into those who have and those who have not secured astronomy-related employment, we find an increase over the previous year in the proportion of graduates whose work is unrelated to astronomy; on the other hand, that group reports considerably higher salaries.

Table X. Employment of 1980–81 astronomy bachelors.

Work activity	Type of employer				Total		Median monthly salary
	Industry	Gov't incl. military	High school	Other	N	%	
Astronomy related:							
Data analysis	2	2	-	2	6	37%	$1 000
Res. & dev.	1	-	-	1	2		
Teaching	-	-	2	2	4		13 reporting
Programming	-	1	-	-	1		
Unrelated to astronomy:							
Programming	6	2	-	1	9	63%	$1 500
Data analysis	5	-	-	-	5		22 reporting
Res. & dev.	3	1	-	-	4		
Other	2	1	1	-	4		
Total	19	7	3	6	35	100%	